

TM 11-5069

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

BATTERY
TEST SET
TS-737/U



DEPARTMENT OF THE ARMY

•

SEPTEMBER 1953



DEPARTMENT OF THE ARMY TECHNICAL MANUAL
DEPARTMENT OF THE AIR FORCE TECHNICAL ORDER

BATTERY TEST SETS AN/USM-63, AN/USM-63A,
TS-737/U, TS-737A/U, AND TS-737B/U

TM 11-5069
TO 33A1-12-64-1
CHANGES No. 2

DEPARTMENTS OF THE ARMY
AND THE AIR FORCE
WASHINGTON 25, D. C., 30 June 1958

TM 11-5069, 21 September 1953, is changed as indicated so that the manual also applies to the following equipment:

<i>Nomenclature</i>	<i>Order No.</i>
Battery Test Set TS-737B/U	13177-PC-58

Change the title of the manual to: BATTERY TEST SETS AN/USM-63, AN/USM-63A, TS-737/U, TS-737A/U, AND TS-737B/U.

Note. A parenthetical reference to previous changes (example: "page 5 of C 1") indicates that the pertinent material was published in that change.

Page 5, chapter 1, note (page 1 of C 1). Delete and substitute:

Note. Battery Test Set TS-737B/U is similar to Battery Test Sets TS-737/U and TS-737A/U. Information in this manual applies to all sets unless otherwise specified.

Page 5, paragraph 1a (page 1 of C 1). Delete the last sentence and substitute:

It applies to Battery Test Sets AN/USM-63, AN/USM-63A, TS-737/U, TS-737A/U, and TS-737B/U.

Page 5. Delete paragraph 2 and substitute:

2. Forms and Records

a. Unsatisfactory Equipment Reports.

- (1) Fill out and forward DA Form 468 (Unsatisfactory Equipment Report) to the Commanding Officer, U. S. Army Signal Equipment Support Agency, Fort Monmouth, N. J., as prescribed in AR 700-38.
- (2) Fill out and forward AFTO Form 29 (Unsatisfactory Report), to the Commander, Air Materiel Command, Wright-Patterson Air Force Base, Ohio, as prescribed in AFTO 00-35D-54.

b. *Report of Damaged or Improper Shipment.* Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as

prescribed in AR 700-58 (Army), Navy Shipping Guide, Article 1850-4 (Navy), and AFR 71-4 (Air Force).

c. Comments on Manual. Forward all comments on this publication directly to the Commanding Officer, U. S. Army Signal Publications Agency, Fort Monmouth, N. J.

d. Parts List Form. Forward DA Form 2028 (Recommended Changes to DA Technical Manual Parts Lists or Supply Manual 7, 8, or 9) direct to the Commanding Officer, U. S. Army Signal Equipment Support Agency, Fort Monmouth, N. J. for comments on parts listings in SIG 7 & 8 AN/USM-63 for Test Set, Battery AN/USM-63.

Page 5, section II, note (page 1 of C 1). Add the following at the end of the note:

Battery Test Set AN/USM-63A consists of Battery Test Set TS-737B/U and Resistor Assembly MX-1678/U.

Page 6, paragraph 5a. Delete the note and substitute:

Note. On the TS-737/U and TS-737A/U, the figures on the high scale read only from 25.2 to 33.6 volts; however, the indicating mark at the end of the high scale will represent a voltage of 34.1 volts. On the TS-737B/U, the indicating mark at the end of the high scale is marked 34.1.

Page 7, paragraph 6d. Delete subparagraph *d* and substitute:

d. Power Consumption, Open Circuit.

Using test prod:

TS-737/U and TS-737 A/U..... .002 watt.

TS-737B/U..... .017 watt.

Using binding posts:

TS-737/U and TS-737A/U..... .030 watt.

TS-737B/U..... .34 watt.

Page 8, paragraph 7, chart, "Length (in.)" column. Add to "8 $\frac{5}{16}$ " a reference to footnote ¹.

Add the following footnote below the chart:

¹ The length of the TS-737B/U is 8 $\frac{3}{4}$ inches.

Page 10. Delete paragraph 11 and substitute:

11. Instruments

(fig. 1)

The battery test sets have one instrument, a dual range voltmeter located on the recessed front panel. The meter dial is calibrated in two scales: a low scale (1.0- to 1.7-volts) and a high scale (25.2- to 34.1-volts). On the TS-737/U and TS-737A/U, the low scale is red and the high scale is black and the meter is a suppressed zero, expanded scale, hermetically sealed instrument. On the TS-737B/U, both scales are black and both scales are linear. The meter used in the TS-737B/U is interchangeable with meters used in previous models.

Page 14, figure 4. On meter M1, add: LO below the right hand "+" terminal. Add: HI below the left hand "+" terminal.

Page 14, paragraph 21. Delete the first three sentences and substitute:

The battery test sets contain a voltmeter that is used in conjunction with a loading resistor. At full scale deflection, the meter of the TS-737/U and TS-737A/U will draw 15 milliamperes and the accuracy between 1.2 and 1.4 volts is $\frac{1}{2}$ of 1 percent. At full scale deflection, the meter of the TS-737B/U will draw 10 milliamperes and the accuracy is $\frac{1}{2}$ of 1 percent over the entire scale.

[AG 413.6 (20 Jun 58)]

BY ORDER OF THE SECRETARIES OF THE ARMY AND THE AIR FORCE:

MAXWELL D. TAYLOR,
General, United States Army,
Chief of Staff.

OFFICIAL:

HERBERT M. JONES,
Major General, United States Army,
The Adjutant General.

THOMAS D. WHITE,
Chief of Staff, United States Air Force.

OFFICIAL:

J. L. TARR,
Colonel, United States Air Force,
Director of Administrative Services

DISTRIBUTION :

Active Army:

ASA (2)	Br Svc Sch (5) except USASCS (25)	USA Sig Sv Team (1)
CNGB (1)	Gen Depots (2) except Atlanta Gen Depot (None)	Yuma Test Sta (2)
Technical Stf, DA (1) except CSigO (30)	Sig Sec, Gen Depots (10)	USA Elct PG (1)
Technical Stf Bd (1)	Sig Depots (17)	Sig Fld Maint Shops (3)
USA Arty Bd (1)	Fld Comd, AFSWP (5)	Sig Lab (5)
USA Armor Bd (1)	Engr Maint Cen (1)	Mil Dist (1)
USA Inf Bd (1)	Army Pictorial Cen (2)	Sectors, USA Corps (Res) (1)
USA Air Def Bd (1)	WRAMC (1)	JBUSMC (2)
USA Abn & Elct Bd (1)	AFIP (1)	Units organized under following TOE's:
USA Avn Bd (1)	AMS (1)	11-7 (2)
USA Armor Bd Test Sec (1)	Port of Emb (OS) (2)	11-16 (2)
USA Air Def Bd Test Sec (1)	Trans Terminal Comd (2)	11-57 (2)
USA Arctic Test Bd (1)	Army Terminals (2)	11-127 (2)
USCONARC (5)	OS Sup Agcy (2)	11-128 (2)
US ARADCOM (2)	USA Sig Pub Agcy (8)	11-500 (AA-AE) (2)
US ARADCOM Rgn (2)	USA Sig Comm Engr Agcy (1)	11-557 (2)
OS Maj Comd (5)	USA Comm Agcy (2)	11-587 (2)
Log Comd (5)	TASSA (13)	11-592 (2)
MDW (1)	Mid-Western Rgn Ofc (TASSA) (1)	11-597 (2)
Armies (5)	USA Sig Eqp Spt Agcy (2)	44-145 (2)
Corps (2)	USA White Sands Sig Agcy (13)	44-146 (2)
USA Corps (Res) (1)		44-147 (2)
Div (2)		44-445 (2)
USATC (2)		44-446 (2)
Ft & Camps (2)		44-447 (2)
Svc Colleges (5)		44-448 (2)
		44-545 (2)
		44-547 (2)

NG: State AG (6); units—same as Active Army except allowance is one copy to each unit.

USAR: None.

For explanation of abbreviations used, see AR 320-50.

TECHNICAL MANUAL

BATTERY TEST SETS AN/USM-63, TS-737/U, AND TS-737A/U

TM 11-5069 }
CHANGES NO. 1 }

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 4 January 1957

TM 11-5069, 21 September 1953, is changed as follows:

The title of the manual is changed to read: **BATTERY TEST SETS AN/USM-63, TS-737/U, AND TS-737A/U.**

The following information changes TM 11-5069 so that the manual also applies to the following equipment:

<i>Nomenclature</i>	<i>Order No.</i>	<i>Serial No.</i>
Battery Test Set TS-737A/U-----	28669-Phila-55--	1 through 214
Resistor Assembly MX-1678/U-----	28669-Phila-55--	1 through 214

Page 5. Chapter 1. Add the following note at the beginning of chapter 1:

Note. Battery Test Set TS-737A/U procured on Order No. 28669-Phila-55 is essentially the same as Battery Test Set TS-737/U. All information applies equally to Battery Test Set TS-737A/U furnished on Order No. 28669-Phila-55 unless otherwise specified in this change.

Page 5, paragraph 1a. Delete the last sentence and substitute: It applies to Battery Test Sets AN/USM-63, TS-737/U, and TS-737A/U.

Page 5, paragraph 1b. Delete the last sentence.

Page 5, section II. Add the following note at the beginning of section II:

Note. Battery Test Set AN/USM-63 consists of Battery Test Set TS-737/U or TS-737A/U and Resistor Assembly MX-1678/U (ch 5).

CHAPTER 5

RESISTOR ASSEMBLY MX-1678/U

(Added)

Section I. DESCRIPTION AND DATA

30. General Description

Resistor Assembly MX-1678/U (fig. 5) is a completely self-contained and portable piece of equipment. Load resistors are mounted within a ventilated sheet metal case. Test leads are stored in the control box mounted on the same chassis to which the ventilated case is fastened. Access to the test leads is provided by a hinged door with a finger-operated locking-type fastener.

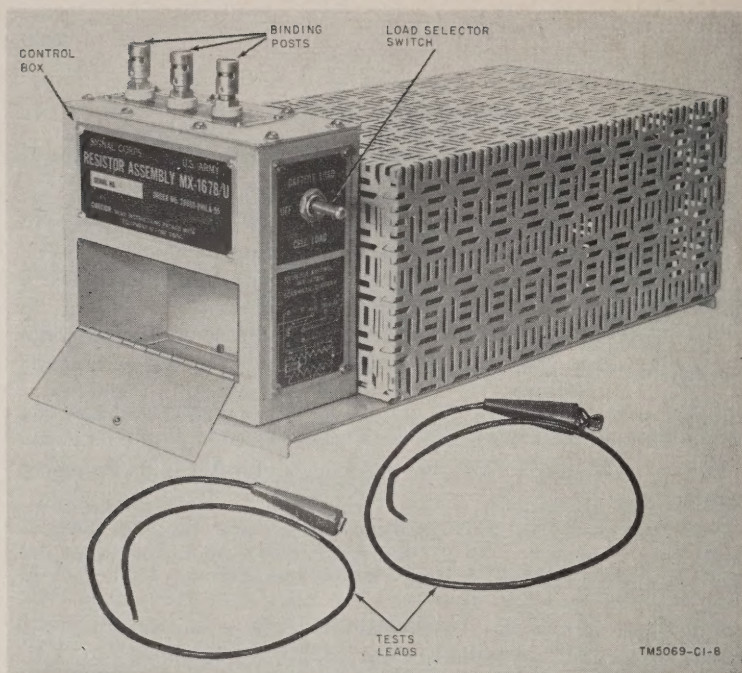


Figure 5. Resistor Assembly MX-1678/U.

31. Purpose and Use

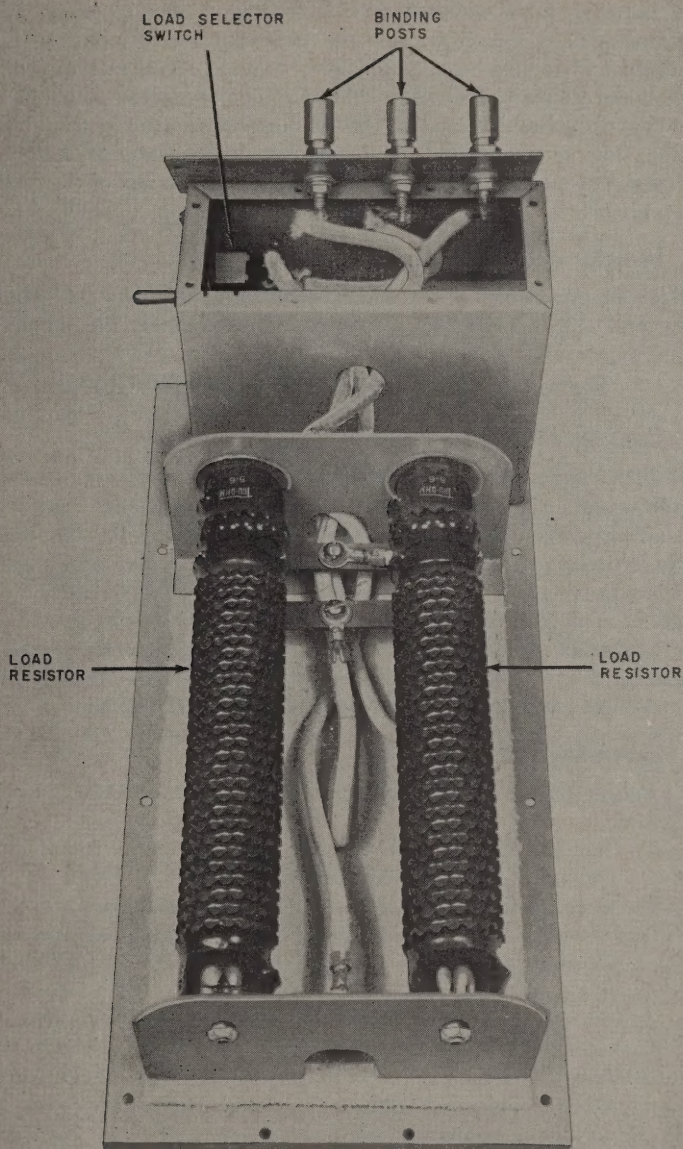
Resistor Assembly MX-1678/U provides a resistance load for testing and discharging batteries. It is used to completely discharge Storage Battery BB-401/U within a short period of time or, when used as part of Battery Test Set AN/USM-63, to test a single cell of this battery under load.

32. Description of Components

a. *Load Resistors* (fig. 6). The resistor assembly contains two 5.6-ohm, 300-watt load resistors. Each resistor is tapped at a point along its length to provide a resistance of 0.234 ohm. Used in parallel, they provide 2.8 ohms of resistance for the battery discharge circuit and 0.117 ohm for the individual cell test circuit.

b. *Load Selector Switch* (figs. 5 and 6). The load selector switch, mounted on the right-hand side of the control box is a double-pole, double-throw, three-position toggle switch with one position non-locking. The switch normally rests in the open-circuit position, but may also remain in the battery discharge position.

c. *Test Leads* (fig. 5). Each of the two test leads is made up of a length of single conductor #12 AWG stranded copper wire with a



TM5069-CI-10

Figure 6. Resistor Assembly MX-1678/U, interior view.

plastic insulating outer jacket and a battery clip attached to one end. The battery clip is covered with a colored rubber insulator. The lead to be used for connection to positive terminations has a red insulator and the lead to be used for connection to negative terminations is covered with a black insulator. The opposite end of the test lead is stripped and tinned so that it may be inserted in the binding posts. The over-all length of each test lead is approximately 24 inches. The test leads are stored inside the control box of the resistor assembly.

33. Weights and Dimensions

Resistor Assembly MX-1678/U is $6\frac{13}{16}$ inches deep, $6\frac{1}{2}$ inches wide, and $13\frac{3}{4}$ inches long. It weighs approximately $8\frac{1}{4}$ pounds

Section II. CONTROLS AND OPERATION

34. Controls

Resistor Assembly MX-1678/U has one control, the load selector switch, which may be placed in any one of three positions. The center or neutral position of the switch is the OFF position. The up position of the switch is the BATTERY LOAD or battery discharge position and is effective only when a voltage is applied between the binding posts marked NEG and BATT. The down position of the switch is the (nonlocking) CELL LOAD position and is used to check a single cell under momentary load and is effective only when a voltage is applied between the binding posts marked NEG and CELL.

35. Operating Procedure

a. Battery Discharge To completely discharge the battery, proceed as follows:

- (1) Remove the test leads from the storage compartment in the control box of Resistor Assembly MX-1678/U.
- (2) Place the load selector switch in the OFF position.
- (3) Press down on the NEG and BATT binding posts and insert the bare ends of the test leads into the holes in the binding posts.
- (4) Connect the other ends of the test leads to the positive and negative terminals of the battery.
- (5) Place the load selector switch in the BATTERY LOAD position. This will allow the battery to discharge to zero voltage in approximately 30 minutes.

b. Cell Test. To test an individual cell, proceed as follows:

- (1) Remove the test leads from the storage compartment in the control box of Resistor Assembly MX-1678/U.
- (2) Place the load selector switch in the OFF position.

- (3) Press down on the NEG and CELL binding posts and insert the bare ends of the test leads into the holes in the binding posts. The test lead with the red battery clip insulator should be inserted into the binding post marked CELL and the lead with the black insulator should be inserted into the binding post marked NEG.
- (4) Connect the battery clip with the red insulator to the positive terminal of the cell under test and the battery clip with the black insulator to the negative terminal of the cell.
- (5) Remove the test prod of Battery Test Set TS-737/U or TS-737A/U from its retaining clip on the back of the case.
- (6) Apply the test prod firmly across the binding posts marked NEG and CELL on Resistor Assembly MX-1678/U, the black prong on the NEG binding post, and the red prong on the CELL binding post.
- (7) Move the load selector switch to the CELL LOAD position and read the voltage on voltmeter M1 of Battery Test Set TS-737/U or TS-737A/U after 10 seconds have elapsed.

Section III. THEORY AND TROUBLE SHOOTING

36. Battery Discharge Circuit

The battery discharge circuit is designed to completely discharge a battery within a short period of time. This is accomplished by connecting the positive and negative battery terminals to the BATT and NEG binding posts on Resistor Assembly MX-1678/U and moving the load selector switch to the BATTERY LOAD position. When this is done, two resistors of 5.6 ohms each are placed in parallel across the battery. This provides a net resistance of 2.8 ohms through which the battery discharges.

37. Individual Cell Test Circuit

The cell test circuit is designed to test an individual cell of a battery. In testing an individual cell, the positive terminal of the cell under test is connected (using the test leads supplied) to the CELL binding post on Resistor Assembly MX-1678/U and the negative terminal of the cell is connected to the NEG binding post. When the load selector switch is placed in the CELL LOAD position, two resistances of 0.234 ohm each are placed in parallel across the cell, presenting a net load resistance of 0.117 ohm. This makes it possible to test the cell under load using the cell test circuit of Battery Test Set TS-737/U or TS-737A/U.

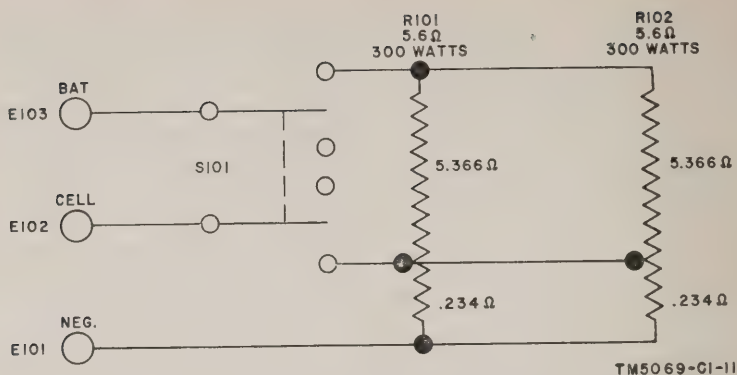


Figure 7 Resistor Assembly MX-1678/U, schematic wiring diagram.

38. Troubleshooting

Faulty operation of Resistor Assembly MX-1678/U will usually be caused by failure of the load resistors, load selector switch, or by bad connections.

a. Failure of the load resistors or load selector switch in the BATTERY LOAD position will result in the inability of the equipment to completely discharge the battery.

b. Failure of the load resistors or load selector switch in the CELL LOAD position will result in an unchanged cell voltage reading when the load selector switch is moved from OFF to CELL LOAD.

c. Corroded, dirty, or loose connections will result in erratic and unreliable operation.

d. To check operation in the BATTERY LOAD position, connect Resistance Bridge ZM-4B/U between the BATT and NEG binding posts and move the load selector switch to the BATTERY LOAD position. The reading on the resistance bridge should be approximately 2.8 ohms.

e. To check operation in the CELL LOAD position, connect Resistance Bridge ZM-4B/U between the CELL and NEG binding posts and move the load selector switch to the CELL LOAD position. The resistance reading should be not greater than 0.129 ohm or less than 0.117 ohm.

f. The schematic diagram (fig. 7) should be followed for accuracy in checking through the circuit.

Page 21. Appendix II. Rescinded

[AG 413.6 (28 Dec 56)]

By Order of *Wilber M. Brucker*, Secretary of the Army:

MAXWELL D. TAYLOR,
General, United States Army,
Chief of Staff.

Official:

HERBERT M. JONES,
Major General, United States Army,
The Adjutant General.

Distribution.

Active Army:

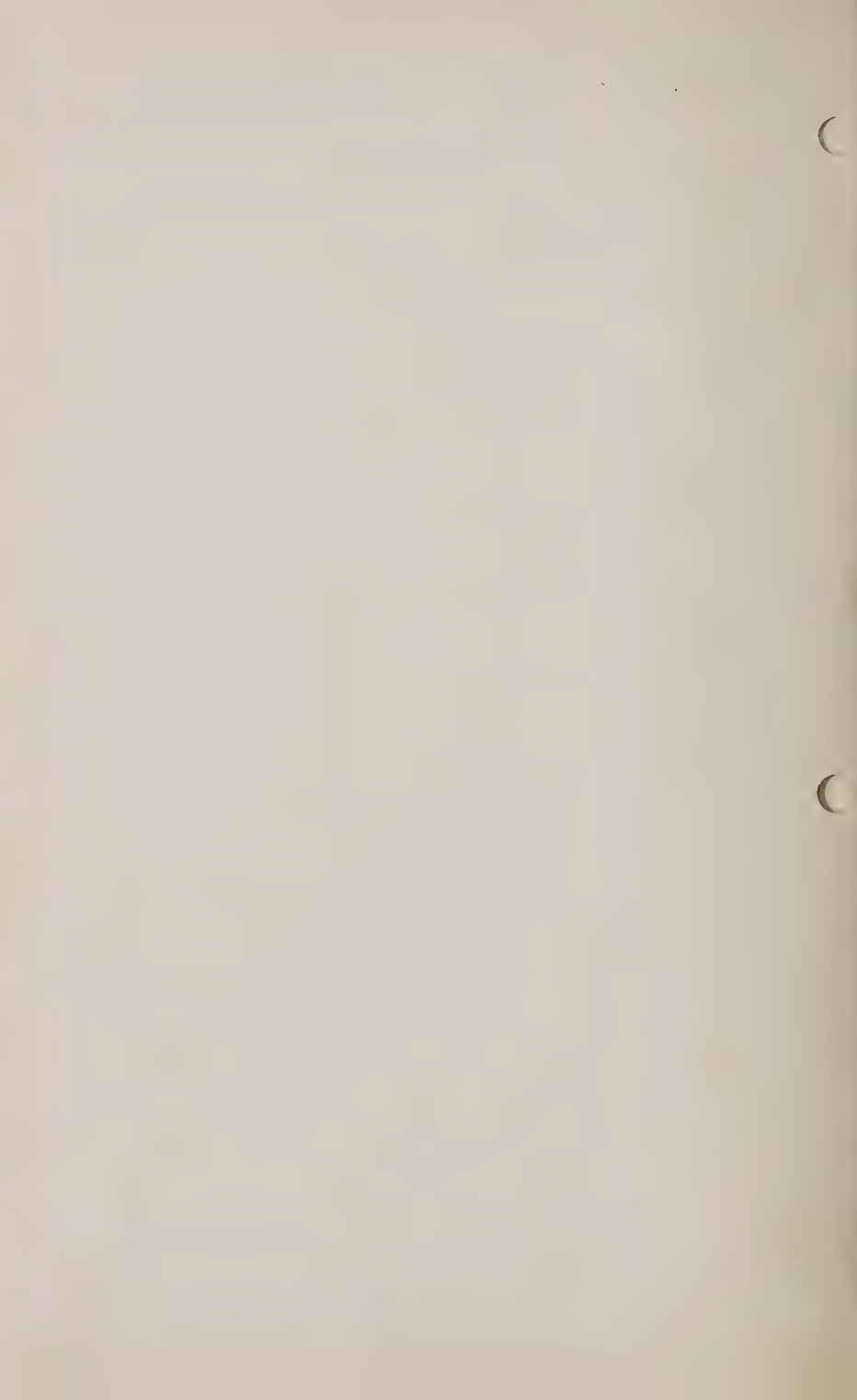
CNGB (1)
ASA (3)
Tee Svc, DA (1) except CSIGO
(30)
Tee Svc Bd (1)
Hq CONARC (5)
CONARC Bd (incl ea Test Sec)
(1)
Army AA Comd (2)
OS Maj Comd (5)
OS Base Comd (5)
Log Comd (5)
MDW (1)
Armies (5)
Corps (2)
Ft & Cp (2)
Sp Wpn Comd (2)
Army Cml Cen (4)
Gen & Br Svc Sch (5) except Sig
Sch (25)
Gen Depots (2) except Atlanta
Gen Depot (None)
Sig Sec, Gen Depots (10)
Sig Depots (17)
US Army Tng Cen (2)
POE (OS) (2)
Trans Terminal Comd (2)
Army Terminals (2)
OS Sup Agencies (2)
Army Elet PG (1)
Sig Fld Maint Shops (3)

Sig Lab (5)
ACS (3)
Mil Dist (1)
Units organized under following
TOE's:
11-7C, Sig Co, Inf Div (2)
11-16C, Hq & Hq Co, Sig Bn,
Corps or Abn Corps (2)
11-57C, Armd Sig Co (2)
11-127R, Sig Rep Co (2)
11-128C, Sig Depot Co (2)
11-500R, Sig Svc Org (2)
11-557C, Abn Sig Co (2)
11-587R, Sig Base Maint Co (2)
11-592R, Hq & Hq Co, Sig
Base Depot (2)
11-597R, Sig Base Depot Co
(2)
44-145R, AAA Msl Bn, NIKE,
Smbl (2)
44-146R, Hq & Hq Btry, AAA
Msl Bn, NIKE, Smbl (2)
44-445C, AAA Msl Bn, NIKE,
Continental (2)
44-446C, Hq & Hq Btry, AAA
Msl Bn, NIKE, Continental
(2)
44-447C, AAA Msl Btry,
NIKE, Continental (2)
44-448C, AAA Msl Btry, Dual-
Con, NIKE, Continental (2)

NG: State AG (6); units—same as Active Army except allowance is one copy to each unit.

USAR None.

For explanation of abbreviations used, see SR 320-50-1



BATTERY TEST SET TS-737/U

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SAFETY NOTICE

1. Sufficient and proper ventilation must be maintained at all times within the room where batteries are being charged; batteries on charge for any length of time will start gassing. This gas, which is given off in the form of vapor, is of a highly explosive nature and is also harmful to the eyes, nasal passages, and the skin. For this reason 2 or 3 gallons of a 3 percent solution of boric acid and a plentiful supply of clear water always should be present where batteries are being tested or charged. If the electrolyte should come in contact with the skin or the eyes, wash the area immediately with the boric acid solution and then flush with quantities of clear water.

2. Extreme caution must be taken when making connections for the purpose of testing, charging, or repairing batteries that are charging or have been recently removed from charge. Such batteries probably will be gassing and the slightest spark, caused by a short circuit, can cause the battery to explode. Personnel working with these batteries are urged to wear a pair of tight-fitting goggles or, better still, the newer type of plastic mask which covers the entire face.

3. Open flames, cigarettes, radio transmitters, generating sets, open-cage electric motors or any other type of equipment that may cause sparks must be kept clear of the charging line.



TM 5069-1

Figure 1. Battery Test Set TS-737/U.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. This manual is published for the information and guidance of the personnel to whom the equipment is issued. It contains information on the operation and organizational maintenance of the equipment as well as a discussion of the theory of operation. It applies only to Battery Test Set TS-737/U.

b. Appendix I contains a list of current references, including supply manuals, technical manuals, technical bulletins, and other available publications applicable to the equipment. Appendix II contains an identification table of parts.

2. Forms and Records

The following forms will be used for reporting unsatisfactory conditions of Army equipment:

a. DD Form 6, Report of Damaged or Improper Shipment, will be filled out and forwarded as prescribed in SR 745-45-5 (Army), Navy Shipping Guide, Article 1850-4, and AFR 71-4 (Air Force).

b. DA Form 468, Unsatisfactory Equipment Report, will be filled out and forwarded to the Office of the Chief Signal Officer, as prescribed in SR 700-45-5.

c. AF Form 54, Unsatisfactory Report, will be filled out and forwarded to Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio, as prescribed in SR 700-45-5 and AFR 65-26.

d. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

3. General Description

Battery Test Set TS-737/U is a completely self-contained and portable piece of equipment designed for checking the terminal

voltages of Storage Battery BB-401 U. It consists of a dual-range voltmeter, a loading resistor, a toggle switch, two binding posts, and a test prod and cord. The complete assembly is housed in a ventilated sheet metal case which is provided with a carrying strap.

4. Purpose and Use

Battery Test Set TS-737 U is designed for checking the terminal voltages of Storage Battery BB-401 U. The battery may be tested as a complete unit, or a check may be made of each individual cell. The complete battery may be checked on open circuit or under a load. *The individual cells must be checked on open circuit or float charge only.* The type of test to be made depends on the results desired.

5. Description of Components

a. *Voltmeter* (figs. 1 and 3). The dual-range voltmeter is a suppressed zero, expanded scale, hermetically sealed instrument. The meter face is calibrated in two voltage scales: a low (1.0- to 1.7-volt) scale which is red, and a high (25.2- to 34.1-volt) scale which is black. The meter is mounted flush on the recessed front panel.

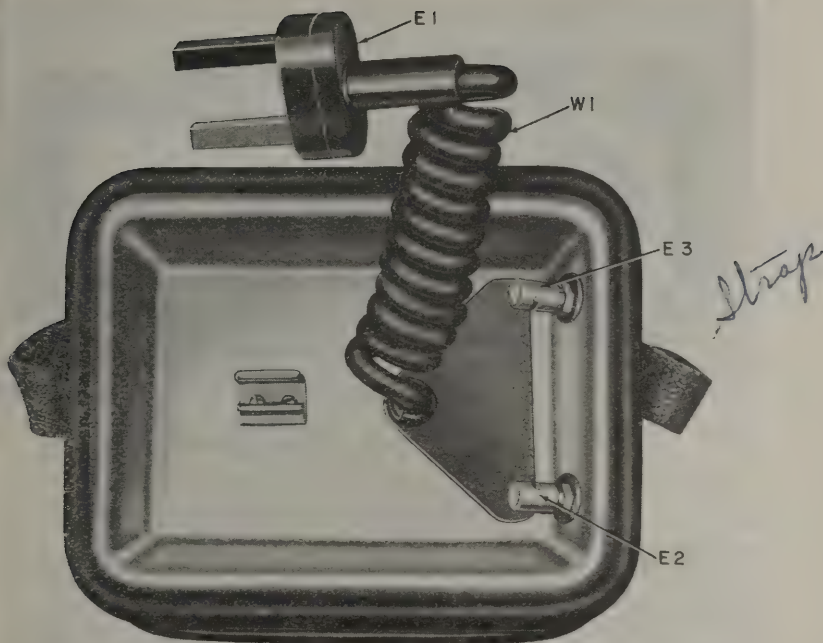
Note. Although the figures on the high scale read only from 25.2 to 33.6 volts, the indicating mark at the end of the high scale will represent a voltage of 34.1.

b. *Load Resistor* (fig. 3). The load resistor is of the fixed type and is wire-wound. It has a resistance of 2.8 ohms, a continuous loading factor of 7.5 amperes, and an intermittent loading factor of 10 amperes. The metal-alloy resistance ribbon is noninductively wound on a refractory tube.

c. *Switch* (fig. 1). The switch is a single-pole, single-throw toggle switch of the spring-return type and normally rests in the open-circuit position. It is mounted on the recessed front panel, to the right of the voltmeter.

d. *Test Prod* (fig. 2). The test prod consists of a plastic handle, two heavy metal prongs with a hole in the end of each prong, and a two-conductor, rubber-covered cord. The positive prong is painted red.

e. *Case* (figs. 1, 2, and 3). The case is made of light-gage metal and is formed in two sections. Both the front and rear sections are recessed and strips of rubber fastened to the perimeter of each section provide protection against accidental damage to the instrument.



TM5069-2

Figure 2. Battery Test Set TS-737/U, rear view.

6. Technical Characteristics

a. Voltage Range.

Using test prod	1.0 to 1.7.
Using binding posts	25.2 to 34.1.

b. Current Rating Under Load.

Continuous load	7.5 amperes max.
Intermittent load	10.0 amperes max.

c. Power Consumption Under Load.

Continuous load	155 watts max.
Intermittent load	280 watts max.

d. Power Consumption, Open Circuit.

Using test prod	0.002 watt.
Using binding posts	0.030 watt.

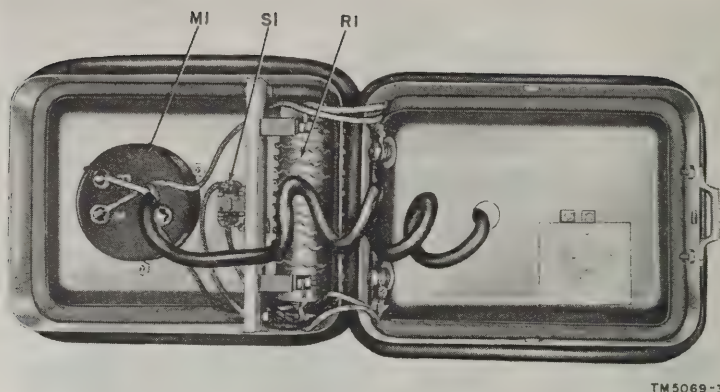


Figure 3. Battery Test Set TS-737/U, interior view.

7. Weights and Dimensions

Item	Depth (in.)	Width (in.)	Length (in.)	Weight (lb)
Battery Test Set TS-737/U (unpacked)	$4\frac{5}{16}$	$6\frac{1}{8}$	$8\frac{5}{16}$	$5\frac{1}{4}$

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

8. Unpacking and Checking Equipment

a. General. When the equipment is received, select a location where it may be unpacked without exposure to the elements.

Caution: Be careful when unpacking and handling the equipment; it is damaged easily when not protected by its packing case.

b. Step-by-Step Instructions for Unpacking.

- (1) Carefully remove the equipment from the outer carton.
- (2) Tear open the moisture-vaporproof wrapping around the inner carton.
- (3) Open the inner carton and carefully remove the tester.

Note. Save the cartons and moisture-vaporproof wrapping. They can be used again when the equipment is repacked for shipment or storage.

c. Checking. Inspect the equipment for possible damage incurred during shipment. If any damage is noted or the equipment does not check with the packing list, fill out and forward DD Form 6.

9. Installation

Battery Test Set TS-737/U is a portable unit and does not require any source of power for its operation. It is ready for use as soon as it is removed from the packing case and no installation or assembly is necessary.

Section II. CONTROLS AND INSTRUMENTS

Note. This section describes, locates, and illustrates the various controls, and instruments provided for the proper operation of the equipment; it also furnishes the operating personnel with information pertaining to these controls and instruments.

10. Controls

(fig. 1)

Battery Test Set TS-737/U has one control, a loading switch, located on the front panel and to the right of the voltmeter. It is

a single-pole, single-throw toggle switch of the spring-return type and normally rests in the open-circuit position. The closed-circuit position of the switch is effective only when the battery being tested is connected to the binding posts (E2 and E3, fig. 2). To close the circuit and load the battery, the handle of the switch is pressed down.

11. Instruments

(fig. 1)

Battery Test Set TS-737 U has one instrument, a dual-range voltmeter, located on the recessed front panel. The meter dial is calibrated in two scales: a low (1.0- to 1.7-volt) scale which is red, and a high (25.2- to 34.1-volt) scale which is black. It is a suppressed zero, expanded scale, hermetically sealed instrument.

Section III. OPERATION

12. Preliminary Procedure

Because of the simplicity of the equipment, no special starting or preliminary procedures are necessary. There are no power source requirements and the only connections necessary are those made to the battery being tested. A brief visual examination usually will suffice to show whether or not the equipment is in good working order.

13. Operating Procedure

a. Testing Individual Cells. Cell tests are established for two purposes: one, to provide a means of checking initially charged and recharged batteries to determine those which are unsatisfactory; and two, to check for failing cells of batteries on float charge. When testing initially charged or recharged cells, allow the battery to stand on open circuit for at least 20 to 28 hours; then proceed as follows:

- (1) Remove the test prod from its retaining clip on the back of the case.
- (2) Apply the test prod across the terminals of the cell, the RED prong on the positive terminal and the BLACK prong on the negative terminal. Be sure that the tops of the cell terminal screws are in the holes in the ends of the test prod prongs.
- (3) Read the voltage on the lower (1.0- to 1.7-volt) scale of the voltmeter. At 80° F., the voltage should read at least

1.3 volts. Cells showing less than this voltage are to be considered unsatisfactory for service.

Note. For cells on float charge the reading should show 1.32 volts at 80° F. and 1.3 volts at 125° F. Cells showing less than this voltage are to be suspected of being defective.

b. Testing Complete Battery.

- (1) Remove the battery from float charge.
- (2) Connect the battery leads to binding posts E2 and E3 on the back of the case. Binding post E2 is positive and can be identified by the RED insulation washer.
- (3) Press down the handle of the loading switch; at the end of 10 seconds the battery voltage should not read less than 29 volts at 80° F. or less than 28 volts at 125° F. on the high (25.2- to 34.1-volt) scale. Batteries showing less than these voltages are to be suspected of containing one or more defective cells.

Note. When the handle of the loading switch is pressed down, the circuit is closed and a 10-ampere load is placed on the battery. Because of this load, a completely constant reading cannot be obtained. (With the closing of the switch, a sudden initial drop, from open-circuit to closed-circuit voltage, is followed by a slower drop of the voltmeter needle.) By holding the switch in the depressed position for 5 to 10 seconds, a steadier reading will be obtained.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. PRESERVATION

14. Weatherproofing

Signal Corps equipment, when operated under severe climatic conditions, requires special treatment and maintenance. Fungus growth, dust, insects, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials. A special moistureproofing and fungiproofing treatment has been devised, which if properly applied, provides a reasonable degree of protection. This treatment is explained fully in TB SIG 13 and TB SIG 72.

15. Rustproofing

To prevent the formation of rust on the equipment, keep all exposed surfaces in good condition. If the equipment is to be exposed to the elements or if it is to be subjected to an extremely damp climate, it may be protected against rust formation by dampening a clean cloth with Oil, Lubricating, Preservative, Special (PL Special) and wiping the case.

Section II. PREVENTIVE MAINTENANCE

16. Definition of Preventive Maintenance

Preventive maintenance is a systematic series of operations performed periodically on equipment to obtain top efficiency in performance, to reduce unwarranted interruptions in service, and to eliminate major break-downs. To understand preventive maintenance, it is necessary to distinguish between it and trouble shooting and repair. The primary function of preventive maintenance is to prevent major breakdowns and the consequent necessity for repair. In sharp contrast, the primary function of trouble shooting and repair is to locate and repair existing defects. The importance of preventive maintenance cannot be overemphasized. Each component of a complete system must be ready to operate at

peak efficiency when needed, and operators and repairmen must maintain all equipment at such standards. The most important preventive maintenance operation is a thorough and systematic inspection at regular intervals. Through these inspections, personnel in charge of the equipment should be able to detect abnormal conditions and forestall major breakdowns.

17. Materials for Maintenance and Cleaning

Use the following materials for maintenance and cleaning of the equipment:

- a.* Clean, dry, lint-free cloth.
- b.* No. 0000 sandpaper.
- c.* Crocus cloth.
- d.* Carbon tetrachloride, technical grade.
- e.* Solvent, Dry Cleaning (SD).

Caution: Carbon tetrachloride will be used only when the use of inflammable solvents would constitute a fire hazard. (Electrical contacts must always be cleaned with carbon tetrachloride.) Repeated contacts of carbon tetrachloride with the skin or prolonged inhalation of the fumes must be avoided. Be sure adequate ventilation is provided.

18. Weekly Maintenance Services

For preventive maintenance services, a weekly period consists of 64 operation hours. Because of the simplicity of the equipment and the manner of its construction, weekly maintenance services are not required. If extreme conditions should prevail and the local commanding officer thinks weekly maintenance services are necessary, then follow the instructions given for monthly maintenance services in paragraph 19.

19. Monthly Maintenance Services

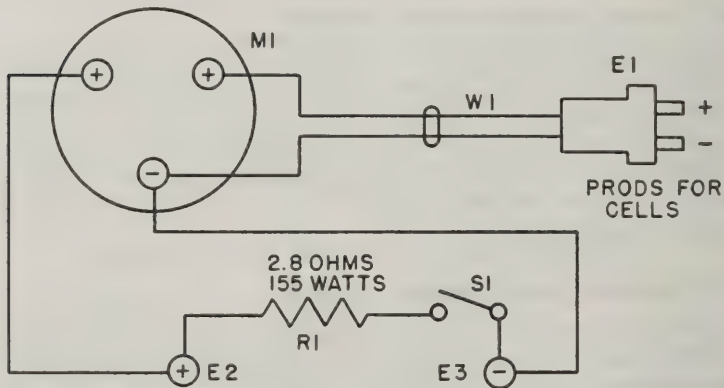
For preventive maintenance services a monthly period consists of 256 operating hours. The preventive maintenance operations listed below should be performed monthly by organizational personnel unless the interval is shortened by the local commanding officer.

- a.* Check the glass cover of the meter face; be sure it is not cracked or broken.
- b.* Check the test prod for damage or corrosion.
- c.* Check the test prod cord for cracked, cut, or frayed insulation.
- d.* Check the loading switch for ease of operation and spring action.
- e.* Check the carrying strap for cuts and fraying.

- f. Remove the four screws that hold the two sections together and separate the sections.
- g. Blow all dust and dirt from the inside of the sections.
- h. Examine the hermetical seals of the voltmeter for cracks or looseness.
- i. Check all wire connections (soldered and mechanical) for cracks or looseness.
- j. Check the resistor for breaks in the winding and for cracks or breaks in the insulation.
- k. Check the binding posts for dirt and corrosion.

20. Cleaning

- a. Clean dirt and corrosion from the test prod prongs with No. 0000 sandpaper and wipe clean with a cloth moistened with carbon tetrachloride.
- b. Clean the outside of the case and the meter glass cover with a cloth moistened with solvent (SD). Wipe dry with a clean, dry cloth.
- c. Clean dirt and corrosion from the binding posts with No. 0000 sandpaper and wipe clean with a cloth moistened with carbon tetrachloride.



TM 5069-4

Figure 4. Battery Test Set TS-737/U, schematic diagram.

Section III. THEORY

21. Voltmeter Circuit

(fig. 4)

Battery Test Set TS-737/U contains a dual-range, suppressed zero, expanded scale voltmeter that is used in conjunction with a

loading resistor. At full-scale deflection, the movement of the meter will draw 15 milliamperes. The accuracy between 1.2 and 1.4 volts is $\frac{1}{2}$ of 1 percent. When testing individual cells with the test prod, the current flows from the positive terminal of the cell through the RED prong, to the low-voltage terminal of the meter, through the meter to the common negative terminal of the meter, and back to the negative terminal of the cell through the BLACK prong. As the current passes through the meter, it causes the needle to deflect. Since the amount of current passing through the meter depends on the voltage being impressed, the meter will indicate the voltage of the cell being tested.

22. Loading Switch Circuit

(fig. 4)

When the complete battery is to be tested, the two binding posts on the back of the test set and two test leads (par. 13) must be used. Two different circuits are possible and they are as follows:

a. Battery Test on Open Circuit. With the loading switch open (normal position), the current flows from the positive terminal of the battery through the RED lead connected to binding post E2, to the high-voltage terminal of the meter, through the meter to the common negative terminal of the meter, and back to the negative terminal of the battery through the BLACK lead connected to binding post E3.

1/2 of 170 at 30 V.

b. Battery Test Under Load. With the loading switch closed, the current flows from the positive terminal of the battery through the RED lead connected to binding post E2; at this point, the major portion of the current is shunted through loading resistor R1, the closed contacts of switch S1, to binding post E3, and back to the negative terminal of the battery through the BLACK lead connected to binding post E3. The lesser portion of the current flows through the same path as the one described in *a* above.

Section IV. TROUBLE SHOOTING

23. Meaning of Trouble Shooting

Trouble shooting involves the detection and location of the cause of faulty operation of the equipment and the correction of the fault before it develops into a break-down which will necessitate major repairs. Trouble shooting consists of sectionalization and then localization of the cause of faulty operation or failure. In sectionalization, the cause is traced through a series of checks to determine the component of the equipment or system in which the

cause of trouble is located. The cause then is localized by a further series of checks to determine the specific part that is responsible for the difficulty or failure. All operational difficulties have certain definite symptoms which will serve as clues to the cause of trouble. Operators should learn to recognize these clues, since they will save valuable time in localizing troubles. After identifying the clue, refer to the trouble-shooting chart (par. 25).

24. Step-by-step Procedures

Faulty operation of Battery Test Set TS-737 'U usually is caused by failure of the loading resistor, loading switch, voltmeter, or bad connections.

a. Failure of the voltmeter probably will result in no movement of the meter.

b. Failure of the loading resistor will result in an unchanged reading of the voltmeter when the loading switch is changed from one position to the other.

c. Failure of the loading switch will result in an unchanged reading of the voltmeter when the switch is moved from one position to the other.

d. Corroded, dirty, or loose connections will result in false voltage readings or no reading at all.

e. When uncertain of the operation of the loading resistor, connect an ohmmeter between binding posts E2 and E3 (fig. 4) and press down the loading switch. The reading should be approximately 2.8 ohms.

f. The wiring diagram (fig. 4) should be followed for accuracy in checking through the circuit.

25. Trouble-shooting Chart

Symptom	Probable cause	Remedy
Meter does not read on either scale.	Defective meter-----	Replace meter.
	Defective wiring-----	Check wiring.
Meter reads on low scale only.	Defective meter-----	Replace meter.
	Defective wiring between binding posts and meter.	Check wiring.
Meter reads on high scale only.	Defective meter-----	Replace meter.
	Defective prod-----	Replace or repair prod.
	Defective cable-----	Replace or repair cable.
Meter reading does not change when loading switch is closed.	Defective resistor-----	Replace resistor.
	Defective switch-----	Replace switch.
	Defective wiring-----	Check wiring.

CHAPTER 4

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

26. General

If the equipment is not to be used for an indefinite period of time or if it is to be shipped a considerable distance, follow the procedures given in *a* and *b* below:

a. Rustproofing. Clean the unit and inspect it carefully for signs of damage; rustproof the unit as instructed in paragraph 15.

b. Tropicalization. The equipment has been coated with a special moistureproofing and fungiproofing compound. After any repairing has been done, the protective coating also must be repaired. This treatment is explained in TB SIG 13 and TB SIG 72.

27. Shipment

When the equipment has been processed as described above, it is ready for shipment or storage. For instructions on packing, reverse the procedure given in paragraph 8.

Section II. DEMOLITION TO PREVENT ENEMY USE

28. Methods of Demolition

a. Smash. Use sledges, axes, handaxes, pickaxes, hammers, heavy tools.

b. Cut. Use axes, handaxes, machetes.

c. Burn. Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

d. Explode. Use firearms, grenades, explosives.

e. Dispose. Bury in slit trenches, fox holes, other holes. Throw into streams, scatter.

Note. Use anything immediately available for the destruction of this equipment.

29. Destruction of Components

When ordered by your commander, destroy all equipment to prevent its being used or salvaged by the enemy.

a. Smash (par. 28*a*) meters, resistors, switches, controls, and cases.

b. Cut (par. 28*b*) all wires, cables, cords, and leads.

c. Burn (par. 28*c*) all technical manuals, instruction books, covers, and packing cases.

d. Bury or scatter (par. 28*e*) all remaining parts of the equipment.

e. Destroy everything.

APPENDIX I

REFERENCES

Note. For availability of items listed, check SR 310-20-3, SR 310-20-4, and SR 310-20-5. Check Department of the Army Supply Manual SIG 1 for Signal Corps supply manuals.

1. Army Regulations

- | | |
|----------|--|
| AR 380-5 | Military Security (Safeguarding Security Information). |
| AR 750-5 | Maintenance of Supplies and Equipment (Maintenance Responsibilities and Shop Operation). |

2. Supply Bulletins

- | | |
|-----------|---|
| SB 11-100 | Serviceability Standards for Signal Equipment in Hands of Troops. |
|-----------|---|

3. Auxiliary Equipment and Test Equipment

- | | |
|------------|---|
| TM 11-4700 | Electrical Indicating and Measuring Instruments; Repair Instructions. |
|------------|---|

4. Painting and Preserving

- | | |
|-----------|--|
| TB SIG 13 | Moistureproofing and Fungiproofing Signal Corps Equipment. |
| TM 9-2851 | Painting Instruction for Field Use. |

5. Camouflage, Decontamination, and Demolition

- | | |
|----------|-------------------------------|
| FM 5-20 | Camouflage, Basic Principles. |
| FM 5-25 | Explosives and Demolitions. |
| TM 3-220 | Decontamination. |

6. Other Publications

- | | |
|--------------|---|
| SR 700-45-5 | Unsatisfactory Equipment Report (Reports Control Symbol CSGLD-247). |
| SR 725-405-5 | Preparation and Submission of Requisitions for Signal Corps Supplies. |

SR 745-45-5	}	Report of Damaged or Improper Shipment
Navy Shipping		(Reports Control Symbols CSGLD-66
Guide, Article		(Army), S and A-70-6 (Navy), and AF-
1850-4		MC-U2 (Air Force)).
AFR 71-4		
TB SIG 66		Winter Maintenance of Signal Equipment.
TB SIG 72		Tropical Maintenance of Ground Signal Equipment.
TB SIG 75		Desert Maintenance of Ground Signal Equipment.
TB SIG 123		Preventive Maintenance Practices for Ground Signal Equipment.
TB SIG 219		Operation of Signal Equipment at Low Temperatures.
TM 11-676		Grounding Procedure and Protective Devices.

APPENDIX II

IDENTIFICATION TABLE OF PARTS

Note. The following is an identification table of parts for Battery Test Set TS-737/U (Sig C stock No. 3F4325-737). The fact that a part is listed in this table is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as a specific T/O&E, T/A, SIG 7 & 8, SIG 7-8-10, SIG 10, list of allowances of expendable material, or another authorized supply basis. The Department of the Army Supply Manual applicable to the equipment covered in this manual is SIG 7 & 8-TS-737/U. For an index of available supply manuals in the Signal portion of the Department of the Army Supply Manual, see the latest issue of SIG 1.

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
W1	CABLE, power: electrical; 2 cond copper, stranded; rubber ins; 300 v max rated working voltage; .340" dia o/a; Koiled Kord, Inc. type No. 8022. CLIP, electrical: ferrule style; beryllium copper; nickel finish; 1 $\frac{3}{8}$ " lg x $\frac{3}{4}$ " wd x 1" h; Federal Television Corp Sig C dwg No. SC-B-76251. HANDLE: black plastic; 2" lg x 2" wd x 1" thk o/a; Federal Television Corp Sig C dwg No. SC-C-76558.	Cable for test lead For holding test prod when not in use. Test prod handle	1B3016-2.26 2Z2712-322 6Z5042-1
E2	HOLDER, contact: black plastic; two $\frac{1}{8}$ " sq openings for cont held by No. 6-32 setscrews; Federal Television Corp Sig C dwg No. SC-B-76557.	Holds test prod tips	2Z3192-5
E1	POST, binding: brass, nickel pl; $\frac{3}{4}$ " o/a h of post above mtg surface when open, $\frac{3}{16}$ " OD; spring type; Eby type No. 6833. PROD, test: 2 rectangular steel tips; plastic handle; 4 $\frac{1}{4}$ " lg x 2" wd x 1" h; 1 tip painted red, other tip painted black; Federal Television Corp Sig C dwg SC-D-76246.	Meter termination point Makes contact with cell terminals.	3Z741-18.5 3F3705-12.7

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
R1	RESISTOR, fixed: WW; noninductive wdg; 2.8 ohms total resistance $\pm 10\%$ tol; 155 w power dissipation; $4\frac{1}{4}$ " lg x $\frac{3}{4}$ " ID x $1\frac{3}{8}$ " OD; vitreous enamel coating; 2 term.; metal alloy resistance ribbon, reflexed, wnd on edge on refractory tube; Ward Leonard Electric Co. type No. Ribflex $4\frac{1}{4}$ " lg.	Loading resistor. -----	3Z5992H8-1
S1	STRAP, carrying: black cotton webbing 1" wd x $44\frac{1}{4}$ " lg; terminated at 1 end w/1" steel buckle, other end terminated w/1" steel end clip; Federal Television Corp Sig C dwg No. SC-D-14253.	For carrying test set. -----	6Z448-33
	SWITCH, toggle: SPST; 15 amp, 30 v dc, 125 v ac; plastic case; $1\frac{3}{16}$ " lg x $\frac{11}{16}$ " wd x $\frac{1}{4}$ " h; momentary action; normally open, 2 solder lug type term., located on back; Sig C dwg No. SC-B-76559.	Load-no load switch -----	3Z9863-42C
M1	TIP, test prod: rectangular bar type; SS; $2\frac{1}{4}$ " lg x $.312$ " wd x $.312$ " thk; Federal Television Corp Sig C dwg No. SC-B-76559.	Contact elements of test prod -----	3F34575-1
	METER, voltmeter: panel mtd; dc; 1.0- to 1.7-volt low scale, 25.2- to 33.6-volt high scale; round plastic case; $\pm 2\%$ accuracy at full-scale reading sensitivity; 1000 ohms per volt; Sig C dwg SC-C-76250 and SC-B-76561.	Voltage indicator -----	3F8030-35

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